

USAF Dehumidification Efforts for Corrosion Control

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Overview



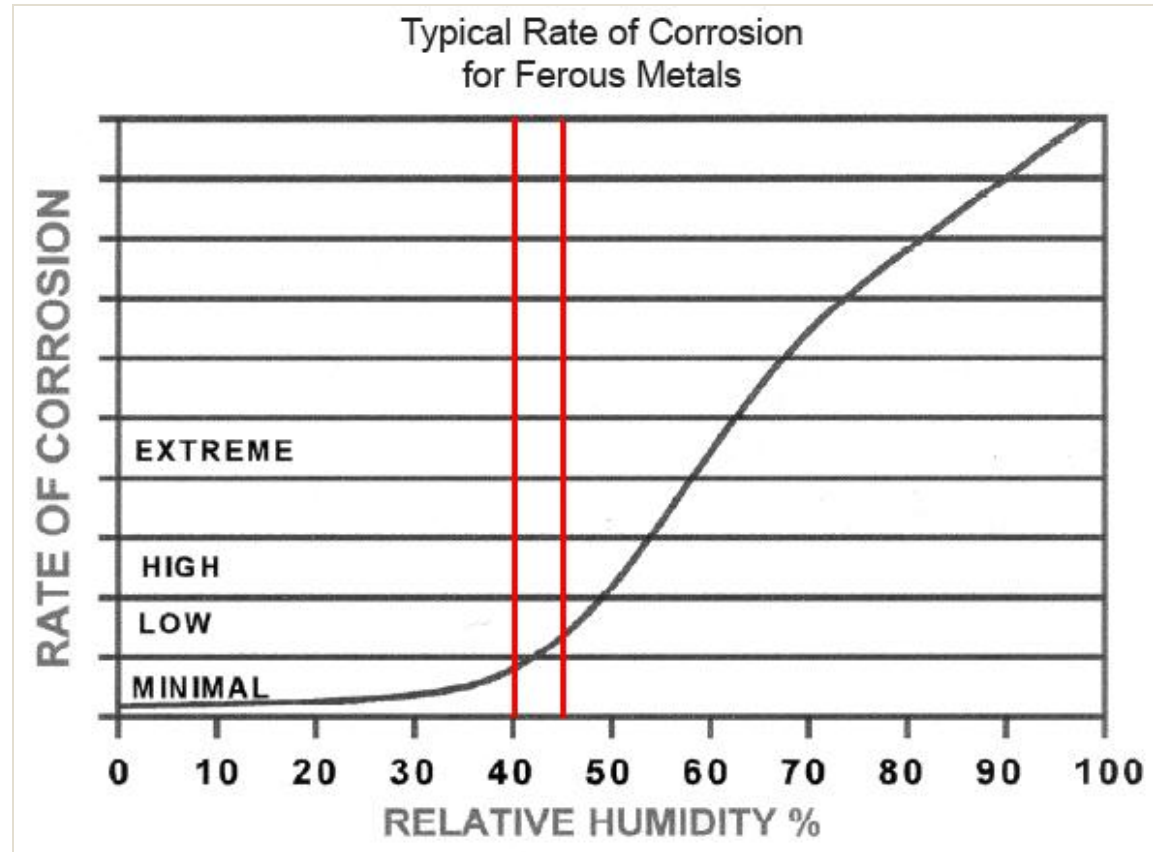
- **Fundamental Corrosion Control**
- **Why DH**
- **DH Concept**
- **Current DH Efforts**
- **Green Shelter**
- **Control Humidity Protection Shelters**
- **DH Evaluations**
- **AFCPCO goals**



Fundamental Corrosion Control



- **Corrosion Conditions**
 - Anode
 - Cathode
 - Electrolyte
 - Electrical Contact
- **Humidity vs. Corrosion**
 - Corrosion rate increases exponentially above 50% RH
 - Typical control range: 30-50% RH
 - Anything below 30% could lead to static charge buildup

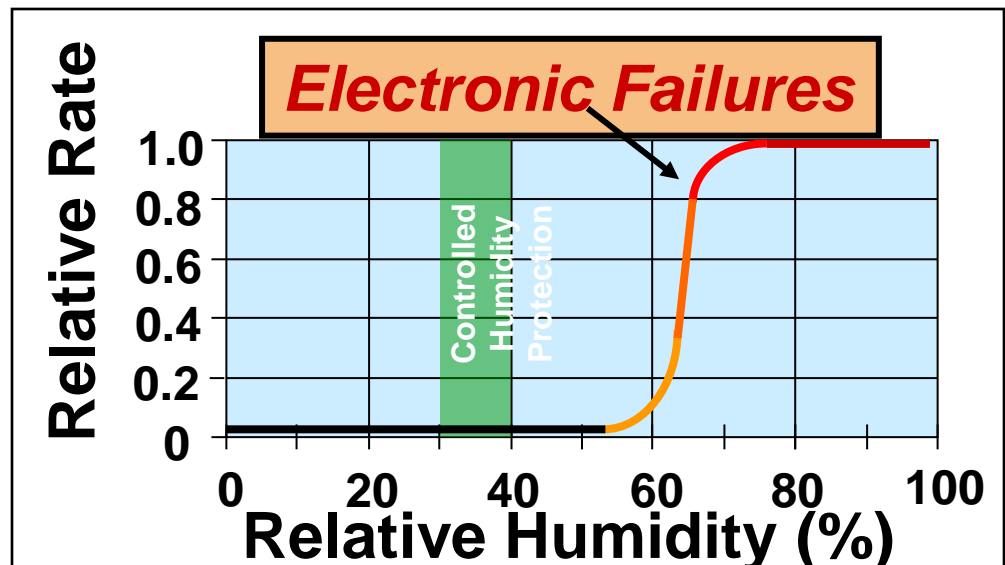


CONCEPT: BREAK THE CORROSION CIRCUIT BY REMOVING THE CONDUCTIVE ELECTROLYTE



Why DH

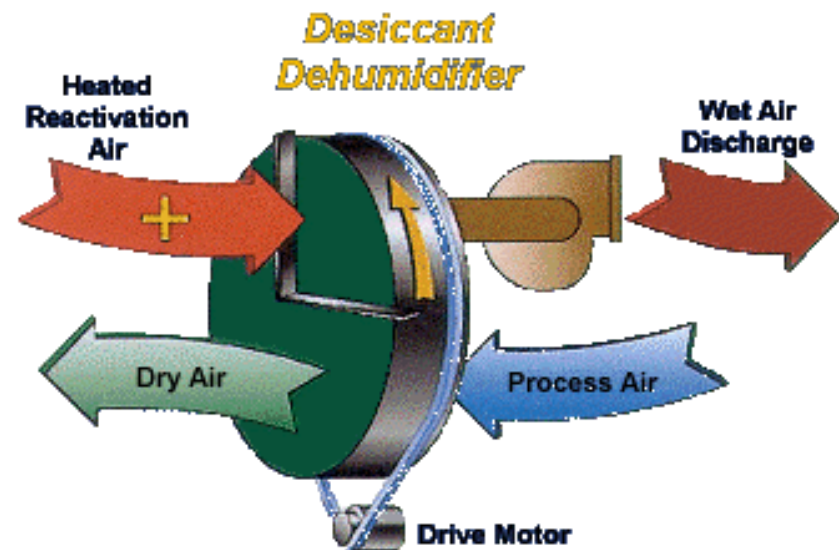
- 15%- 20% electronic failures due to moisture induced corrosion
- DH most effective method to protect equipment from corrosion
- Seen 9 to 1 ROI
 - Reduced maintenance costs
 - Improved reliability





DH Concept

- Dehumidification (DH) can be achieved by:
 - Cooling - vapor condensation
 - Heating - air expansion
 - Desiccants - materials with high affinity for water
 - Combination thereof
- DH can be Sheltered or Unsheltered
- Air Dehydration Units
 - Uses a self rejuvenating desiccant wheel dehumidifier
 - Closed or open loop





Current DH Efforts

- **Unsheltered Controlled Humidity Protection**
 - Uses mobile DH units
 - Reduces moisture derogation of avionics and electronic systems
- **Current CHP efforts**
 - KC-135, Hickam AFB, HI
 - F-16, McEntire ANG, SC
 - C-130, McEntire ANG, SC
 - F-22, Tyndall AFB, FL

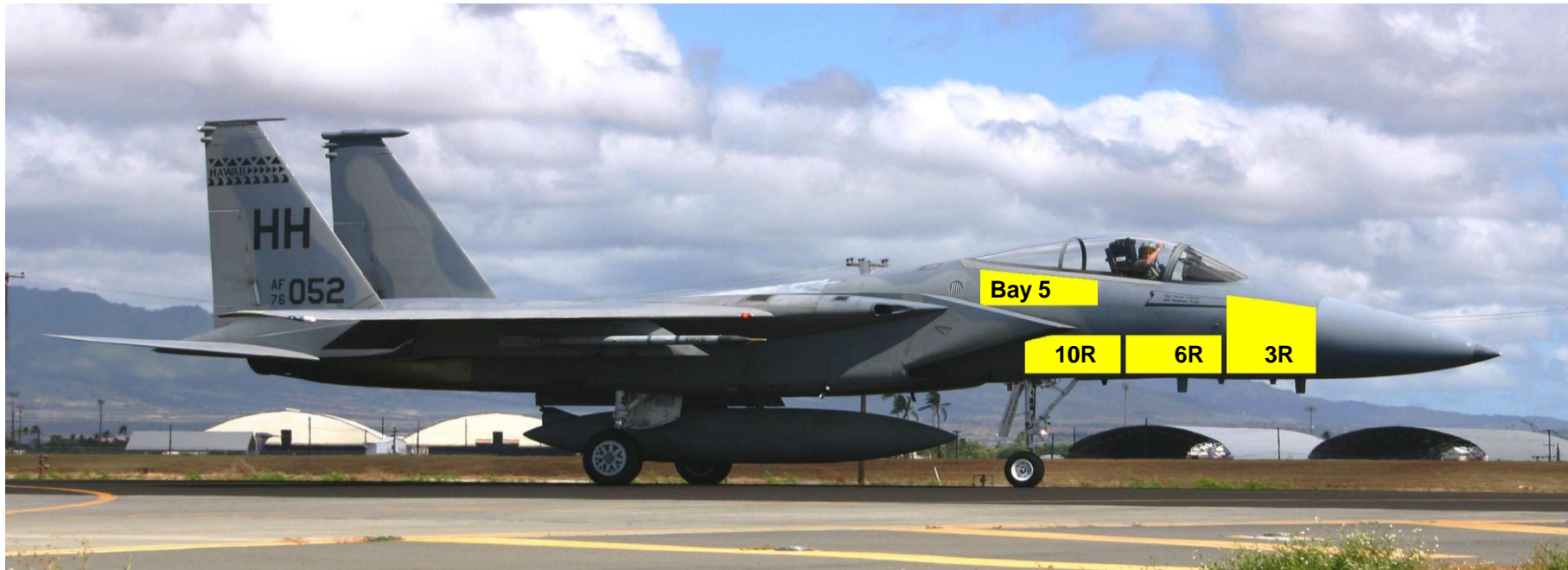




Current DH Efforts



- **General Location of Most LRU's Dehumidified**





Current DH Efforts





Current DH Efforts

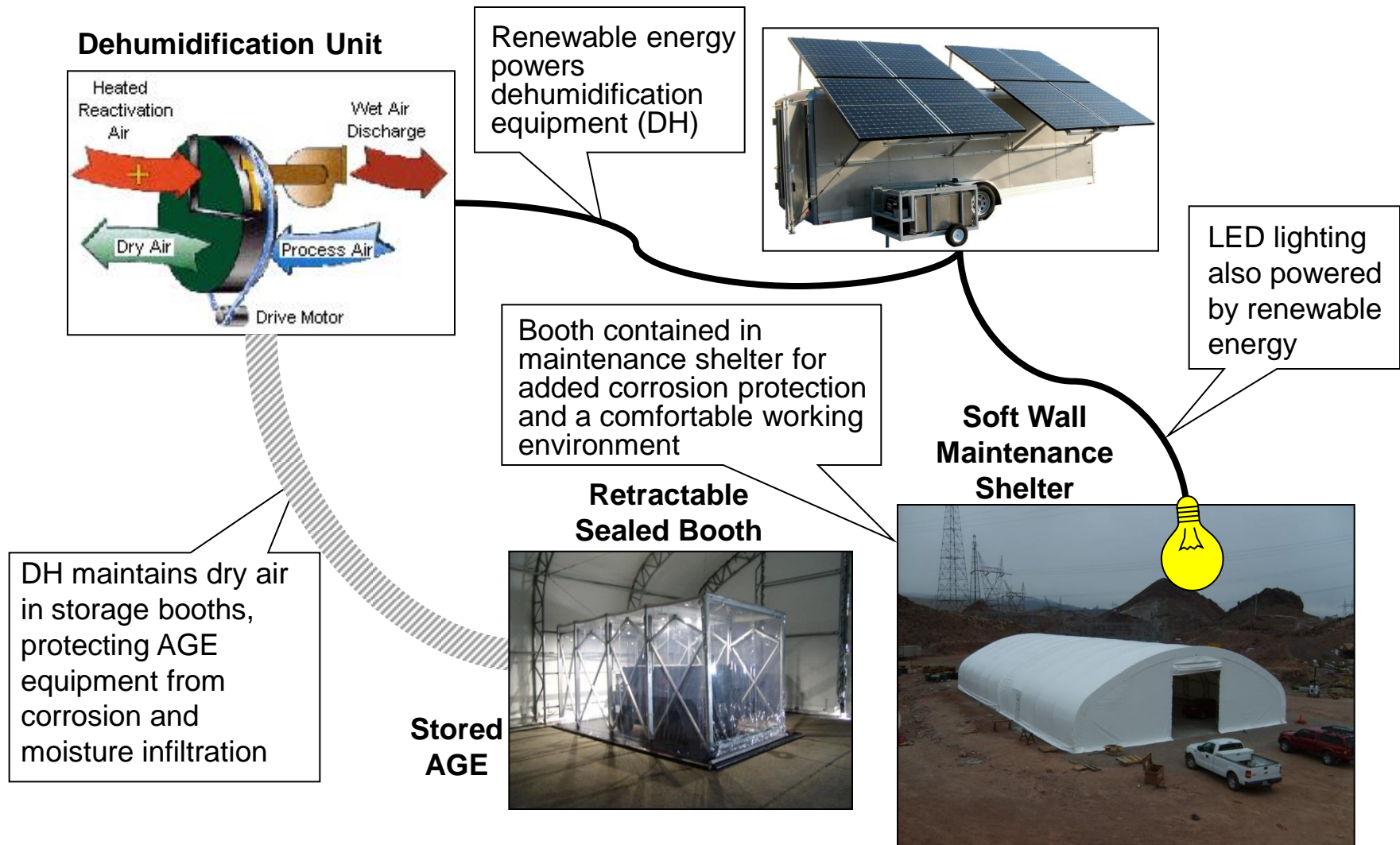


- **Sheltered Controlled Humidity Protection**
 - Climate controlled
 - For aircraft and AGE
- **Current efforts**
 - AGE, Savannah ANG, GA
 - AFCPCO Green Shelter test
 - AGE, Hickam AFB, HI
- **Future Shelter efforts**
 - F-22, Hickam AFB, HI
 - Kadena AB, Japan





The Green Shelter





CHP Shelters



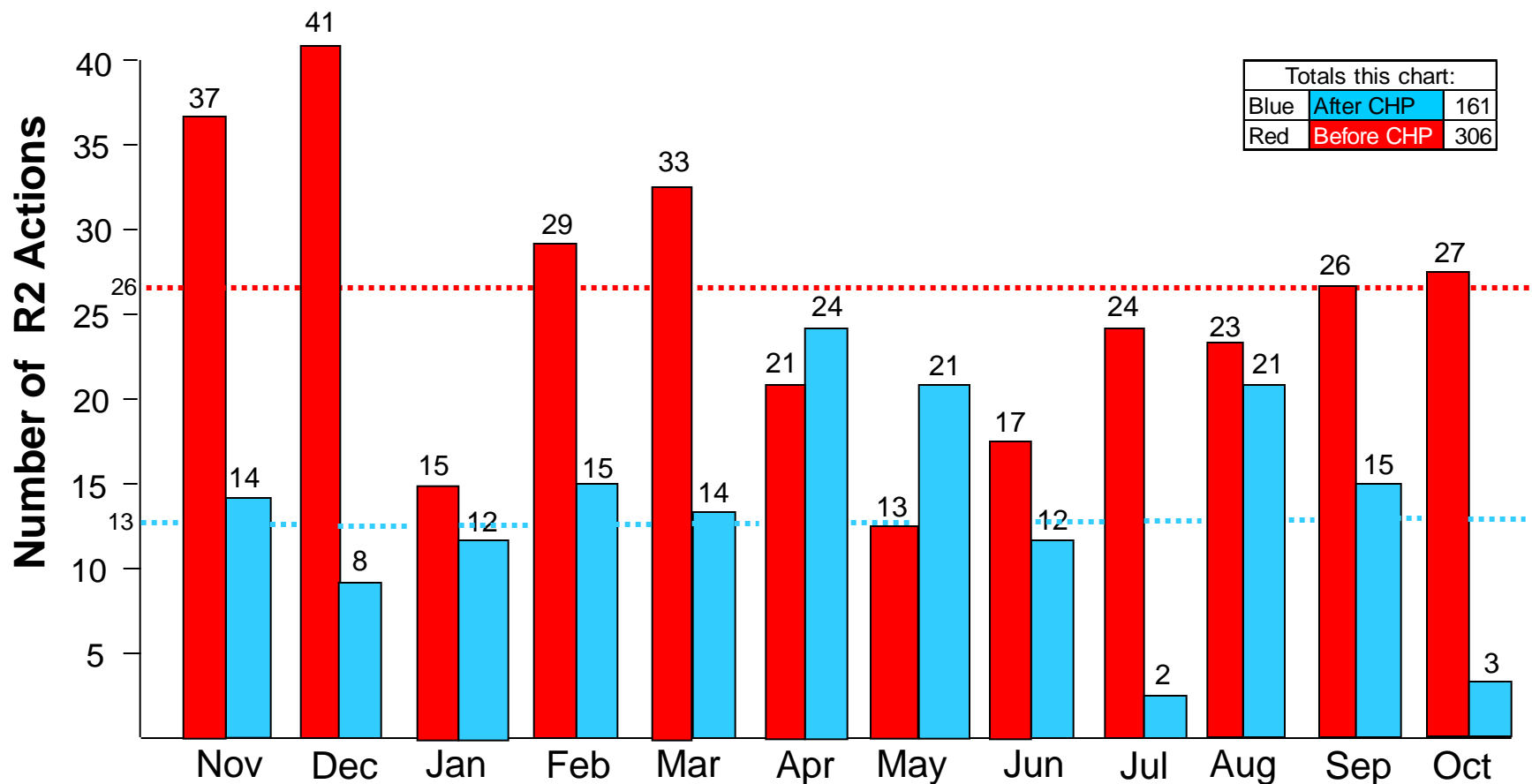
- **Used to prevent corrosion on outer skin**
- **Being developed for the F-22 at Hickam AFB**
- **Pre-Engineered Steel Structure designed specifically for DH**





DH Evaluation

**F-15A/B LRU Remove & Replace (R2) Comparison:
R2 Actions Reduced by 47% After CHP**





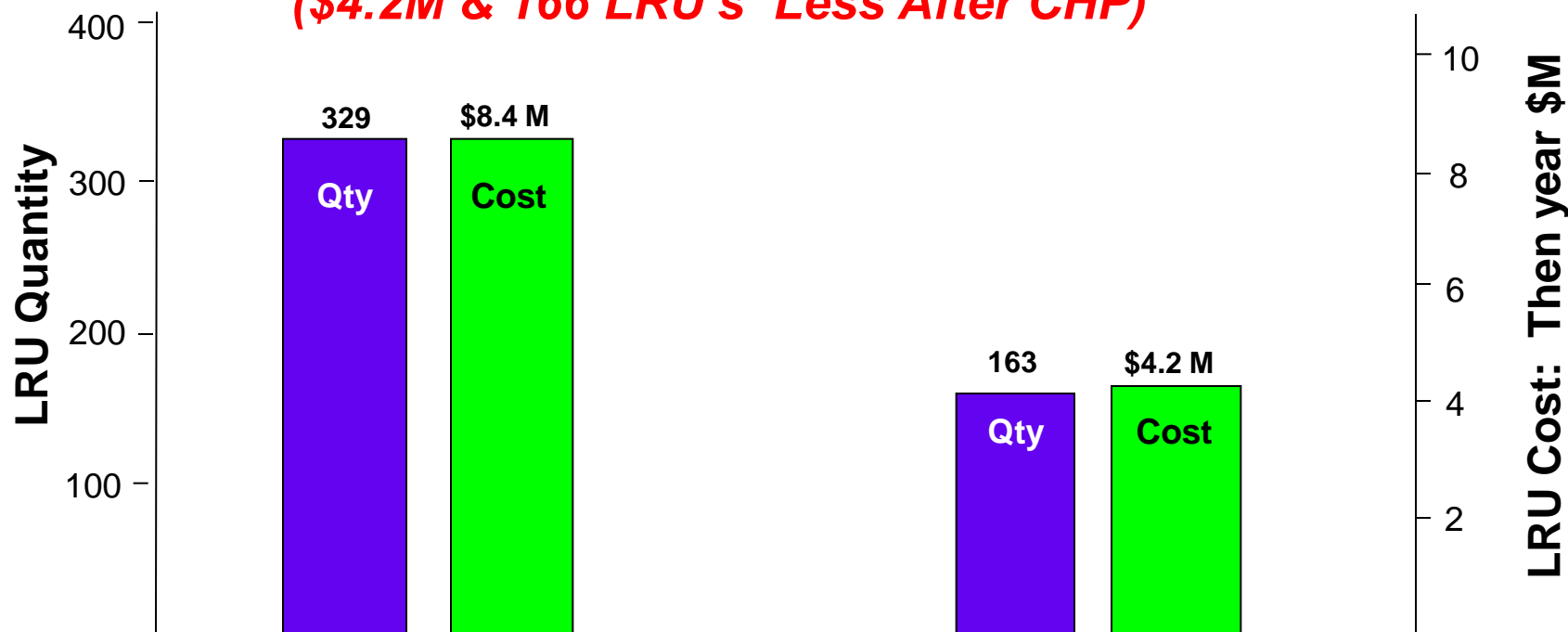
DH Evaluation



F-15 A/B LRU Cost & Quantity Comparison After 12 Months

Issue Costs and Quantities 50 % Less After CHP
(\$4.2M & 166 LRU's Less After CHP)

16 CHP Slots
Used avg
47% of time
for all A/B/C/D
model F-15s



Before CHP
Nov 05 thru Oct 06
Average possessed acft: 19

After CHP
Nov 06 thru Oct 07
Average possessed acft: 14



DH Evaluations



Service	Timeframe	Equipment	Results
RAF	2000s	Tornados	24% decrease in “no fault” discrepancies 15% decrease in avionics maintenance
US Navy	1993	EP-3 Aries	Avionics reliability improved 25% Increased MTBF 7-30%
US Navy	1995	A-6E Intruder	Increased MTBF 21%
US Army	1997-1998	UH-60 Blackhawk	Savings of \$2.2 million



DH Evaluations



Service	Timeframe	Equipment	Results
USAF	2006	KC-135, Hickam	TBD
USAF	2006	F-15, Hickam	R2 actions reduced by 47% Labor hours reduced by 31% monthly
USAF	2008	F-16, McEntire	TBD
USAF (AFCPCO)	2009	AGE, Savannah	50% Decrease in corrosion from sealed booth to shelter 50% Decrease in corrosion from shelter to outside
USAF	2011	F-22, Tyndall	TBD



AFCPCO goals



- **Condition-based maintenance (CBM+)**
 - High Velocity Maintenance (C-130)
 - Maintenance Steering Group (MSG-3)
- **New DH chapter on TOs**
 - 1-1-691
 - 35-1-3
 - -23
- **Expeditionary Combat Support System (ECSS)**



Summary



- **Fundamental Corrosion Control**
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Questions



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